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Strongly Interacting Electrons at Complex Oxide Interfaces: From Growth to Physics

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Complex oxides are a class of materials containing a variety of competing strong interactions that create a subtle balance to define the lowest energy state, which leads to a wide variety of interesting properties (e.g., superconductivity, magnetism, and so on). By utilizing the bulk properties of these materials as a starting point, interfaces between different classes of oxides offer an opportunity to break the symmetry present in the bulk and alter the local environment. Utilizing advances in oxide growth, one can now combine materials with distinctly different and even competing orders to create new materials in the form of heterostructures. The broken symmetry, strain, and altered environments at the interfaces then provide an avenue to manipulate this subtle balance and perhaps even create new phases.

The next big step in understanding these fascinating phases, however, requires detailed studies of the heterostructure properties *in situ* and often during growth. Here I will touch on several recent examples to illustrate how a powerful combination of X-ray probes and advanced growth techniques offer the ability to probe interface properties to gain unique insight into the underlying physics.